general comraderie which has heretofore distinguished the botanists of this country.

It is the broadened horizon for botany in general which makes the outlook for vegetable physiology so especially auspicious. This is the country of all others where its practical and educational importance is likely to be most fully recognized, and where the best equipped and most independent laboratories can most readily be established. One difficulty yet besets it, the difficulty of making known what is needed. Botany has not before required much more than a table near a window for its miscroscope and reagents, a case for the herbarium and a few shelves for books, and it is difficult to make it understood that the new department needs rooms with special fittings and expensive apparatus. If there were only one well equipped laboratory in the country it might be cited as a model, but even that advantage is yet lacking. It can be explained that the chemical side of the subject needs much of the usual chemical apparatus and supplies with many special pieces, that the physical side requires similar provision, and that many pieces of apparatus are demanded which cannot be obtained in the markets owing to the newness of the subject, necessitating provision for making apparatus of both metal and glass; but the explanation rarely conveys a full appreciation of how essential and extensive this equipment is expected to be. In the fitting of the laboratory there should be rooms for the chemical work with gas, water, sinks and hoods, and rooms for the physical work, with shafting for transmitting power to clinostats and centrifugals, with devices for regulating moisture and temperature, and with as ample provision for light as in a greenhouse. There should also be dark rooms into which a definite amount of light may be introduced by means of arc lamps, and other special rooms for special lines of study. It is easy to see that a well stocked greenhouse is required to supply healthy plants when needed for study, but the value of a botanic garden may not be so apparent. It need not only be pointed out here, however, that Charles Darwin examined 116 species of plants belonging to 76 genera to prepare his brochure on climbing plants, and it might have been more complete with greater opportunities.

The man who is to preside over a department of this kind, in which research work is to be carried on and instruction undertaken suitable to a university, cannot be one of St. Thomas Aquinas's *homo unius libri*, for physiology touches upon the adjacent sciences to a far greater extent than do other departments of botany, and requires a more intimate acquaintance with a wide range of knowledge.

After careful consideration of the subject, it seems safe to predict that the next great botanical wave that sweeps over America will be a physiological one. As the green chlorophyll grain of vegetation is the great primal storage battery absorbing and fixing the energy of the sun, and making it available for doing the work of the world—in fact, supplying nearly all the power, except that from wind and waters required in commercial enterprise, whether derived finally from animal force, wood, coal, steam or electricity, so the subject which includes the fundamental study of a matter of such universal importance will without doubt eventually attain to a place in public esteem commensurate with its importance.

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CURRENT NOTES ON PHYSIOGRAPHY (XVI.).

NATIONAL GEOGRAPHIC MONOGRAPHS.

THE fourth number of this series is an essay on the 'Present and Extinct Lakes of Nevada,' by Professor I. C. Russell, of the University of Michigan. This is a serviceable abstract of the fuller treatment of the

subject in Russell's Geological Survey Monograph on Lake Labontan. Besides several figures, it contains a general map, showing the areas of present and extinct lakes, and three maps of larger scale, one of which from surveys by W. D. Johnson exhibits certain details of extinct shorelines with great nicety. All the illustrations are, however, only reproductions of those already published in the survey monograph above mentioned, and thus have less freshness than new illustrations would have.

The fifth monograph is on the 'Beaches and Tidal Marshes of the Atlantic Coast' by Professor N. S. Shaler, of Harvard University. This is for the most part occupied with an account of shore processes rather than shore forms, and is in only a secondary way concerned with the Atlantic Coast. Unfortunately, it has no illustrations, and the number of specific examples of shore forms, described ready for teachers' use, is comparatively small. It seems too much to call our off-shores and-bars 'indestructible shields' of the continent; and to say that upon them the 'ocean waves.....break without effect.'

The sixth monograph, on the 'Northern Appalachians,' by Bailey Willis, of the U. S. Geological Survey, contains a greater amount of new material and new presentation than the two preceding numbers. The region between the Blue Ridge on the east and the Alleghany front on the west is called the 'Greater Valley,' in distinction from the 'Great Valley' of general usage, which does not include the ridge-and-valley area west of the slate and limestone lowland. The general lowland level of the Greater Valley is described as a surface of denudation, and is called the Shenandoah 'base-level;' the ridges rise above it, not yet worn down; the streams traverse it in trenches, excavated since a moderate uplift of the region. The ancient surface, of which the even uplands and the level crest lines of the ridges are remnants, is called the Kittatinny 'base-level;' this is also recognized as a peneplain, but of ancient date, and now much dissected by the excavation of the valley floors. The three chief divisions of the region 'constitute a group, in which the Blue ridge may be called a continental range; the Greater Valley a tilted litoral zone; and the Alleghany front, which confronts the old continent of Appalachia, an inland-facing escarpment.' ['*Inface*' has lately been suggested as a more compact name for the last mentioned topographic form.] The Shenandoah is shown to have gained length by diverting to its own course the headwaters that once belonged to Beaver Dam creek; Snicker's Gap in the Blue Ridge representing the former outlet of the now diverted headwaters, and the beheaded creek now rising on the eastern slope of the ridge.

THE COMPOSITE ORIGIN OF TOPOGRAPHIC FORMS.

Under the above title Prof. A. P. Brigham has contributed an essay to the Bulletin of the American Geographical Society (XXVII., 1895, 161–173) in which he brings together a number of illustrations of the various processes, constructive and destructive, by which the forms of the land are assumed. He emphasizes the importance of this aspect of geographical study: "The teacher of physiography has no greater reward than is his where a student assures him that henceforth his native State will be to him a new country, or that he will see the hills and valleys of his old home with new eyes. . . . . Every journey becomes fraught with meaning, and the traveller who has caught the spirit of modern geography will not report the great plains of Kansas and Nebraska as 'uninteresting.' It must, however, still be said that many colleges deny their graduates this appreci-

ative eye. But even the secondary and earlier grades cannot much longer deprive their pupils of this best fruit of geographic study."

TIDAL STREAMS ABOUT THE BRITISH ISLES.

Two small folios of tidal stream charts, one for the North Sea, the other for the west coast of Scotland, have recently been prepared from official material by F. H. Collins (London, Potter, 1894, five shillings each). Each folio contains twelve charts for successive tidal hours. In several localities, as the Strait of Dover and the Frith of Clyde, the opposite movement of the tidal currents is shown within moderate distances; thus exhibiting nicely the origin of the currents in the orbital motion of the water within the tidal wave. The continuance of flood tide after high water, and of ebb tide after low water, commonly observed in straits and estuaries, and puzzling to many vacation observers, is thus simply explained. A series of similar tidal charts for our Atlantic sounds and bays would be an interesting product of our Coast Survey office.

METEOROLOGICAL CHARTS OF THE RED SEA.

THIS atlas contains twenty-four charts, showing chiefly the winds and the currents for every month. They have been prepared by C. A. Baillie, Marine Superintendent of the (London) Meteorological Office (London, Eyre and Spottiswood, 1895; 21 shillings). The charts of the winds are based on 75,000 observations, mostly along the axial line of the sea. The wind roses exhibit both frequency and force. From June to September northwesterly winds prevail over all the Red Sea, with southwesterly winds east of the entrance strait; from October to January there are northerly winds over the northern half, and southerly over the southern half; from February to May the northerlies gain on the southerlies, and return to summer conditions. The surface currents are irregular, fluctuating with the winds. This is especially marked at the strait, where no persistent surface inflow is indicated, to compensate the deep outflow that has been described as a steady current and ascribed to the excessive salinity of the sea.

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PRELIMINARY NOTE ON A CONTAGIOUS INSECT DISEASE.

SINCE the establishment, July 1st, at the Illinois State Laboratory of Natural History, of a distinct department for the continuous investigation of the contagious diseases of insects, this work, in which Mr. B. M. Duggar is immediately engaged, has taken two principal directions.

In the first place *Sporotrichum globuliferum* Speg., well known as the fungus of the white muscardine of the chinch bug and of many other insects, was studied œcologically, especially with reference to the effect of exposure of the fungus in its various stages of germination, growth and fruiting for various lengths of time, to a graduated series of temperatures. The troublesome liability of this species to arrest of growth or to complete destruction by drouth, by heat and by cold, together with the fondness which certain prolific field mites have shown for it as an article of food, has led us to search diligently for a *bacterial* insect disease, presumably less susceptible to these conditions than the muscardines.

Such a disease Mr. Duggar has been fortunate enough to find among a lot of squash bugs (*Anasa tristis*) brought into the laboratory for experimental uses. It has now been clearly shown that this disease is due to a motile bacillus larger than *B. insectorum* Burrill, and of different form, preferably aërobic in habit, but capable, nevertheless, of growing beneath the surface of agar, where the colonies are commonly oval or